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Original Article

Highly qualified grass hockey sportswomen's adaptation to training intensity in the macrocycle preparatory period

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Abstract:
The article presents the methodical approach to organizing of highly qualified grass hockey sportswomen's adaptation to training intensity in the macrocycle preparation. **Material and methods**. 19 highly qualified grass hockeysportswomen have taken part in the research. The sportswomen average age is 24,5±3,1 years. Sports qualification is the Ukraine Sport Master, the Ukraine Sport Master of International Level. **The research purpose** is to identify and to justify the methodological approach to organizing of highly qualified grass hockey sportswomen during the preparatory period of the macrocycle considering their adaptation to athletic demands of training and competing. **The research methods:** analysis and summarizing of the special literature and Internet data; pedagogical observation; pulsometry; pedagogical testing; chronometery; methods of mathematical statistics. **Results.** Six zones of training intensity are determined: 1st - heart rate is 114-132 beeps per min/bpm (restoring demands); 2nd - 132-144 bpm(restoration-supporting demands); 3rd - 144-156 bpm(supporting demands); 4th - 156-168 bpm(developing demands); 5th - 168-180 bpm(developmental demands); 6th — 180-186 bpm(developmental demands). The various training and intensity interrelation of highly qualified grass hockey sportswomen to training intensity in the macrocycle preparation has been determined. **Conclusion**. Highly qualified grass hockey sportswomen's adaptation to the athletic intensity of training and competing during the macrocycle preparatory period should be carried out according to the phase of the physical fitness development.
Key words: adaptation, highly qualified grass hockey sportswomen, the macrocycle preparation

Introduction

The problem of adaptation to training intensity is one of the main ones in the common system of sportswomen preparation. The investigation of this issue within certain structural formations of the training process is very significant. This is due to particularities of both short-term and long-term adaptations (Platonov, 2013; Shynkaruk, 2017). Short-term adaptation is characterized by the direct response of the body to a single exercise impact. Long-term adaptation covers a larger period of time, develops gradually and is the result repetitive work-out summation (Volkov et al, 2000).

The issues of highly qualified athletes' adaptation to training demands during the preparatory period of the macrocycle were discussed in publications by Platonov (2008, 2013), Volkov et al (2000), Shkrebtii (2005), Wilmore, Costill (1994),. Fleck,. Kramer (2004) and others. In his fundamental work "Sports Training Periodization. The General Theory and its Practical Application (2013)"("Periodizatsiya sportivnoy trenirovki. Obshchaya teoriya i ee prakticheskoe primenenie"), V.N. Platonov describes short- and long-term adaptations considering the impact of training intensity on sportsmen's organisms.

The development of biochemical adaptation regarding training principles as well as the interaction of training effects is presented in the research of Volkov et al (2000).Shkebtiy (2005) researched the adaptational aspects of the problem of managing training and competing intensity in structural units.Wilmore's and Kostyl's works (1997) are devoted to physiological adaptational reactions to the intensity of athletes' physical activity.

The studies of. Godik (2006), Seluianovet al (2003), Kostiukevych (2006), Tiulenkov (2007), Fedotova (2007) are devoted to the specifics of sportsmen's adaptation in team game sports. In particular, the physical preparation problem of football players in the annual training cycle was researched by Godik (2006). The energy

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supply for the physical activity in the process of football players' adaptation to training intensity was examined in the work of Seluianovet al (2003). The development of the long-term adaptation of the football player's organism depending on the influence of the athletic intensity of various directions was studied by Pshybylskyi,.Mishchenko (2004), Kostiukevych (2006). The adaptive reactions of highly skilled grass hockey athletes during the direct preparation for the competition were determined by Fedotova (2007).

At the same time, the number of studies on the problem ofhighly qualified sportswomen's adaptation, including team game sports, to training intensity is limited. This is the consequence of the fact that the female representatives' training process is often based on the usual men-oriented methodology, where the predominant direction is the increasing of the athletic intensity level. All things considered, it seems advisable to study the problem ofhighly qualified grass hockey sportswomen's adaptation to training intensity in the preparatory period of the macrocycle.

The purpose is to define and substantiate the methodical approach to organizing highly qualified grass hockey sportswomen's training processes in the preparatory period of the macrocycle, taking their adaptation to training and competing intensity into account.

Material and Methods.

Participants. 19 highly qualified grass hockey sportswomen have taken part in the research. The sportswomen's average age is 24,5±3,1 years. Sports qualification is the Ukraine Sport Master, the Ukraine Sport Master of International Level. The agreement of all players was got to participate in the study.

*Study Organization***.** Studies were conducted during the preparatory period of the seasons 2014-2015 using the methods described below. The special literature and Internet data analysis and synthesis was used for the theoretical study of sportswomen's adaptation problem to their physicalintensity. Chronometery was carried out to determine the time for different types of sportswomen training. The pedagogical observation object was the structure and content of the training process of the highly qualified grass hockey sportswomen. The demands and direction of training intensity were determined based on pulsometry methods. Pedagogical testing could determine the level of sportswomen physical preparation and included the use of tests - 30 m run from a high (standing) start, a standing long-jump, a 180 m shuttle run (bleep test), 2,000 m run, which were carried out according to the generally accepted methodology, and was described in details in our previous studies (V. Kostiukevych, N. Lazarenko, N. Shchepotinaet al., 2019; Byshevets, et al., 2019). Pedagogical methods were also used to determine the functional parameters of sportswomen, such as integral adaptation index (IAI), operational recovery index (ORI), operational adaptation index (OAI), maximum oxygen consumption (MOC) due to physical performance (PWC_{170}) based on the method of the bicycle ergometry and running test ($PWC_{170\ (v)}$).

According to the results of the "Shuttle run 180 m" test (bleep test), the integral indicator of Nevmianov's adaptation (IAI) can be determined.

$IAI = t\ (f_1 + f_2 + f_3)$,

where t is the test time doing;

f_1, f_2, f_3–heart rate (HR)for 10 s at the end of the first, second and third minutes of recovery.

The IAI indicator describes the adaptation level of the grass hockey sportswomen bodies to the intensity of anaerobic glycolytic purposefulness. The lower the IAI, the better the training level of the sportswoman.

It is worth saying that the adaptation integral indicator to anaerobic glycolytic intensity offered by A.M. Nevmianov (1982) does not fully show the specifics of grass hockey competitions, since the components of the IAI are exercises time and recovery of the heart rate (HR) within 3 minutes, and the grass hockey sportswomanrarely has the opportunity to renew during this game time. An analysis of the grass hockey sportswomen competitions can conclude that there are often match pauses of "specific rest" within the 1st minute (drawing penalty corner kick , kick-off the ball from the goal, stoppage of the game, connected with injuries of players, etc.).

Therefore, it is advisable to assess the level of grass hockey sportswomenadaptation considering specific intensity, as well as Nevmianov's integrated adaptation indicator, to use two more indicators developed by one of the article's authors (V. Kostiukevych, 2006): operational recovery and adaptation indexes.

The operational recovery index (ORI)is determined by the formula:

$$ORI = 100 - \frac{f_r \cdot 100}{f_w}$$

where f_w – heart rate during 10 sec after "Shuttle run 180 m" test (bleep test);

f_r– heart rate at the end of the first minute of recovery during 10 sec (from 50 till 60 sec).

The operational adaptation index (OAI) is determined by the formula:

$$OAI = \frac{(f_w - f_r)}{t} \cdot 100,$$

where$t$ is the test time doing of "Shuttle run 180 m" test (bleep test)

In order to determine the physical efficiency of grass hockey sportswomen and maximumoxygen consumption, the running version of the $PWC_{170(v)}$ test was used (Karpman, 1988; Belotserkovskyi, 2005). This method is based on a linear dependency between sprint speed and heart break frequency. The grass hockey sportswomen do the first intensity without a warming-up, running 700 meters in 5 minutes, at the end of the intensity the heart rate is measured. After a 5-minute rest, the second intensity is performed - running 1100 m in 5 minutes. At the end of the second intensity is recorded HR.The physical efficiency of the $PWC_{170(v)}$ is determined by the formula:

$$PWC_{170(V)} = V_1 + (V_2 - V_1)\frac{170 - f_1}{f_2 - f_1},$$

$$V_1 = \frac{S_1}{t_1},$$

where S_1 is the length of the first distance;

t_1 - time to overcome the first distance;

V_1 - the physical alertness of overcoming the first distance;

V_2* - the physical alertness of overcoming the second distance;

f_1 - HR at the end of the first intensity;

f_2 - HR at the end of the second intensity.

The value of $PWC_{170(v)}$ is converted to PWC_{170}in *kgm per min*.

Z.B. Belotserkovskyi (1988)formula is used in this case:

$PWC_{170} = 299 \cdot PWC_{170(v)} - 36$.

The absolute maximum oxygen consumption (MOC_{abs}) is determined below:

$MOC_{abs} = 1,7 \cdot PWC_{170} + 1240$

and comparative maximum oxygen consumption (MOC_{com}):

$$MOC_{com} = \frac{MOC_{abs}}{BW},$$

where BW –a sportswomen body weight.

*Statistical analysis***.**The obtained data were processed by mathematical statistics using MS Excel software. The arithmetic meaning is calculated, the standard deviation is S, the coefficient of variation is V. The options were checked for the maximum distribution of the research results using the Shapiro-Wilky criterion.

The results of the study.

The main task of grass hockey sportswomenpreparation is to increase their training to the level that will be able to adapt effectively to the competition's specifics. Similar tasks cannot be solved during several training classes and even during several macrocycles. According to the preparing practice of highly qualified grass hockey sportswomen, the duration of such period for the main competitions lasts from 50 to 70 days. During this period, two problems are mainly solved:

-grass hockey sportswomenadaptation considering training intensity, which is characterized, on the one hand, by their ability to do all tasks in training completely, and, on the other hand, by the organism ability to endure training intensity, i.e. the ability to renew completely from previous intensity and the willingness to the next ones;

-grass hockey sportswomenadaptation considering competitions, i.e. their ability to do effectively all the functions assigned them in accordance with the rules of the game, the tactics chosen, other circumstances characterized by the opponent's game, the field state, spectators behavior, arbitration (referee work), weather conditions, etc.

The solution of these tasks is possible only with such an organization of the training process, which will be able to complicate the training program visibly at each stage of preparation.

There are the following main directions of complicating the process of athletes preparation (Platonov, 1997):

1) the total amount increase of training and competition doing during the mesocycle or macrocycle;

2) the intensity increase of the training process;

3) changing the focus of the training process and increasing the part of specific impact according to the total amount of training;

4) the use of extra-training and out-of-competition factors that increase the needs on the athletes body.

Thus, the dynamics of training load considering the adaptation of grass hockey sportswomenshould have a positive direction (Fig. 1). Despite of comparatively general increase in the amount of training, during the preparatory period for grass hockey sportswomen, the balance of loadleading has the different direction.So, the largest amount of aerobic are observed in the warming-up mesocycle and then decrease in other mesocycles. At

*It is similar to V_1

the same time, the mixedprocess increases significantly in the basic developing mesocycle compared to the warming-up mesocycle and then increases gradually in the basic stabilizing and pre-competitive mesocycles. As for the processes of anaerobic-alactate and anaerobic-glycolytic ones, the first one significantly increases in the basic developing mesocycle, and then slightly decreases in other mesocycles, and the second one has a positive tendency to increase in the first three mesocycles and decreases in the pre-competitive mesocycle.

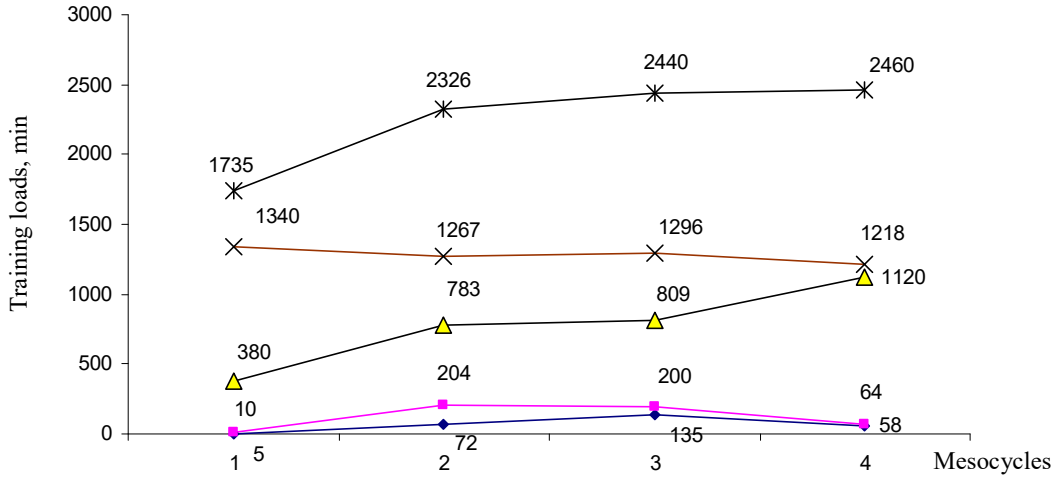

Fig. 1. The total amount and the dynamics of training loadsin the training preparatory period of highly qualified grass hockey sportswomen

1 - warming-upmesocycle; 2 - basic developing mesocycle; 3 – basic stabilizing (control and preparatory) mesocycle; 4 - precompetitive mesocycle

- total amount of training loads; - aerobicpower supply mode; - mixed (aerobic-anaerobic) power supply mode; - anaerobic-alactatepower supply mode; - anaerobic-glycolytic power supply mode

Adaptation to training loadsof grass hockey sportswomen in the preparatory period is also carried out using various means of the training process (Fig. 2). As can be seen, from the one mesocycle to another, there is a tendency towards a decrease in the nonspecific and increase in specific means of the training (Fig. 2).

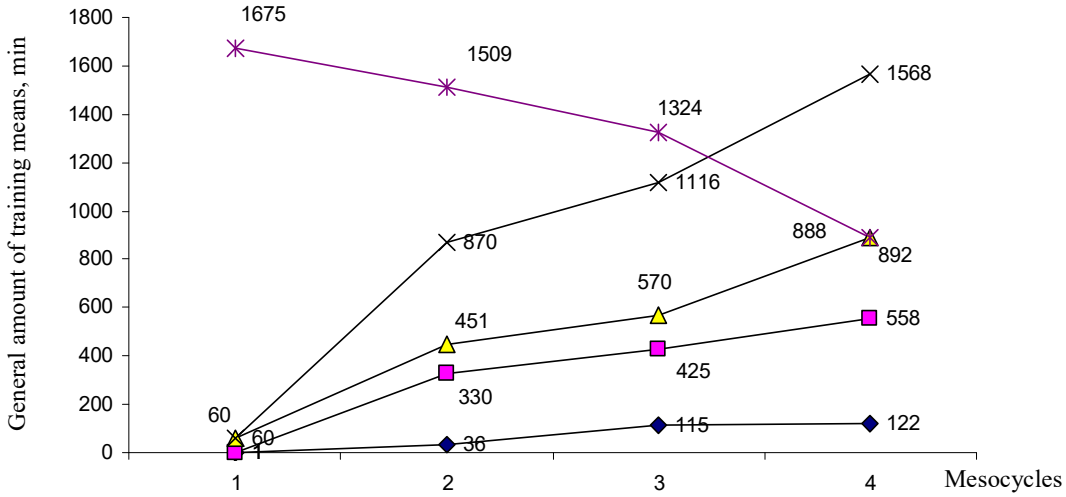

Fig. 2. The total amount and dynamics of the training means in the preparatory period of highly qualified grass hockey sportswomen:

1 - warming-up mesocycle; 2 - basic developing mesocycle; 3 - basic stabilizing (control and preparatory) mesocycle; 4 - precompetitive mesocycle

- non-specific means; - specific means; - preliminarymeans; - competitive means; - special preparatory means

It is worth saying that among specific means the greatest dynamic is observed in the application of preliminary and competitive exercises. As for the special preparatory exercises, their use increase in the basic mesocycles, and then a slight decrease in the pre-competitive mesocycle. Analysis of figure 1 and 2, can confirm that during the preparatory period, the training of the two basic (developing and stabilizing) and pre-competitive mesocycles have the greatest effect on the adaptation of highly qualified grass hockey sportswomen. All the mesocycles training of the preparatory period was taken into account in our research, depending on the different intensity zones (Table 1). Recovery training was planned in the 1st zone, recovery and support in the 2nd, supporting - in the 3rd zone. The physical qualities were improved and the functional training of the grass hockey sportswomen was increased in the 4th and 5th zones. Training in the 6th zone was mainly aimed at improving the level of special efficiency, primarily to adapt to the competitive intensity.

Table 1

Training Demands Planning in Different Zones of Intensity of Team Game Sports (Kostiukevych, 2006)

Zone №	Heart rate, bpm	Direction		Demands parts			
		Physiological	Pedagogical	Non-specific	Specific		
					Technical and tactical preparation	Game preparation	Competition preparation
1st	114-132	aerobic	Recovery	Athleticism, flexibility	1st coordination complexity modes (CCM)	-	-
2nd	132-144	aerobic	Recovery-Maintaining	Athleticism, flexibility, general endurance	1st-2-nd CCM	-	-
3rd	144-156	aerobic	Maintaining	general endurance, speed and muscular strength	2nd-3-rd CCM	With Tactical task	-
4th	156-168	Aerobic-anaerobic	Developmental	general endurance, speed and muscular strength	2nd-3-rd CCM	Adaptation to competitions	Test games
5th	168-180	Aerobic-anaerobic	Developmental	general endurance, speed and muscular strength	2nd-3-rd CCM	Adaptation to competitions	Official games
6th	180-196	anaerobic	Developmental	speed, speed endurance	Principally 3rd CCM	Adaptation to competitions	Official games

Two 6-days macrocycles and one 5-days recovery were carried out, during the base developmental mesocycle (BDM). Trainingin macrocycles was divided into general physical training (GPT), special physical training (SPT), technical and tactical training (TTT), game training (GT) and competitive training (CT) (Table 2). The total amount of training was 2068 minutes. The largest amount of the mesocycle belongs to general physical training exercises - 1285 min (62,1%).

The special physical preparation exercises of players improving have included 160 min (7,0 %). Technical-tactical and competitive preparation exercises training were used in the same quantity just about, 243 min (11,8%) and 280 min (13,6%) accordingly. The least training time was devoted to playing preparation - 100 minutes (4,8%). As far as, BDM main task nor only to restore special physical skills of the ball possession, but also, to adapt players to competitive intensity. As a result, it is important to carry out BDM with possibility to arrange competitions through preparatory or bilateral games.

If we consider the distribution of the grass hockey sportswomen training means by intensity zones, the largest amount of BDM exercises was done in the 2nd recovery and support (31,4%) and 5th development (22,7%) zones. The training intensity impact of different directions in this mesocycle was as follows: 57,6% was performed mainly in the aerobic power supply mode; 34,7% were mixed (aerobic-anaerobic) loads and 7,7% anaerobic loads, including 4,1% alactic and 7,6% glycolytic.

The main objective of the following basic stabilizing (control and preparatory) mesocycle (BSM) was to increase the level of players adaptation to specific loads, primarily to aerobic-anaerobic and anaerobic ones.

Table 2

The training distribution means for highly qualified grass hockey sportswomen by intensity zones in the basic developing mesocycle

Training means, min	Training demands intensity zones by heart rate, bpm						Total, min	Balance (ratio), %
	1	2	3	4	5	6		
	114-132	133-144	145-156	157-168	169-180	181-196		
GPT	217	586	271	60	151	-	1285	62,1
SPT	-	-	-	-	84	76	160	7,0
TTT	52	65	101	25	-	-	243	11,8
GT	-	-	-	75	25	-	100	4,8
CT	-	-	-	70	210	-	280	13,6
Total, min	269	651	372	230	470	76	2068	-
Balance (ratio), %	13,0	31,4	14,3	11,1	22,7	7,5	-	-

Notes (here and below): GPT- general physical training , SPT- special physical training, TTT - technical and tactical training, GT - game training and CT- competitive training

The BSM structure included two 7-days shock and one 5-days recovery macrocycles. The total amount of training has increased slightly compared to BDM - 2265 min (Table 3). The table analysis shows that the GPP exercises have significantly decreased from 62,1% to 37,9%, while the SPT exercises have increased from 7,0% to 10,8% and the GT increased from 4,8% to 9,7%. Specific exercises increased too: TTT - from 11,5% to 15,9%, GT - from 4,8% to 9,7%, CT - from 13,6% to 25,7%. What about the intensity zones, the most time of grass hockey sportswomen was devoted to the 1st aerobic recovery zone – 31,7%, in the 4th and 5th aerobic development zones – 23,7 and 19,1%, respectively. Thus, the total amount of recovery loads 31,7%, recovery-maintaining - 12.8%, maintaining - 8.4% and developing - 47.4%. The BDM previous developmental loads was 41,3%.

Table 3

The training distribution means for highly qualified grass hockey sportswomen by intensity zones in the basicstabilizing (control and preparatory) mesocycle

Training means, min	Training demands intensity zones by heart rate, bpm						Total, min	Balance(ratio), %
	1	2	3	4	5	6		
	114-132	133-144	145-156	157-168	169-180	181-196		
GPT	549	271	40	-	-	-	860	37,9
SPT	-	-	70	67	44	65	246	10,8
TTT	171	20	70	71	15	15	362	15,9
GT	-	-	12	104	95	10	221	9,7
CT	-	-	-	296	280	-	576	25,7
Total, min	720	291	192	538	434	90	2265	-
Balance(ratio), %	31,7	12,8	8,4	23,7	19,1	4,3	-	-

The precompetitive mesocycle (PM) was the sportswomenfinal stage of adaptation considering specific loadsduring the preparatory period. Two 6-days preliminaryand one 3-days recovery-maintaining macrocycles were presented in this mesocycle. The PM total amount of training decreased to 1527 minutes (Table 4), in distinction from the basic mesocycles.

Table 4

The training distribution means for highly qualified grass hockey sportswomen by intensity zones in theprecompetitive mesocycle

Training means, min	Training demands intensity zones by heart rate, bpm						Total, min	Balance(ratio), %
	1	2	3	4	5	6		
	114-132	133-144	145-156	157-168	169-180	181-196		
GPT	186+84	106+50	101	20	-	-	547	35,8
SPT	-	-	-	-	118	26	144	9,4
TTT	58+36	12+35	97+65	56	25	-	384	25,1
GT	-	-	25	77	55	15	172	11,3
CT	-	-	-	140	140	-	280	18,4
Total, min	364	203	288	293	338	41	1527	-
Balance(ratio), %	3,8	13,3	18,9	19,2	22,1	2,7	-	-

As it should be assumed, TTT balance enlarged from 25,1% and GT- 11,3 %. The SPT balance is almost the same as in the previous mesocycle – 9,4%, which is generally due to the greater use of the special-

preparatory exercises aimed at increasing of special speed and endurance compared to BDM and BSM. The balance of recovery, recovery-maintaining and maintaining intensity to developing ones is 56 to 44% in this mesocycle. Developing load has not so much amount as BSM, it is due to the general tendency of the amount decrease and demands intensity in the precompetitive mesocycle, compared to the basic mesocycles of the preparatory period.

A good example of the grass hockey sportswomen's adaptation to specific loadsduring the preparatory period can be fig. 3. The grass hockey sportswomen adaptation of BDM, BSM and PM is characterized, on the one hand, by a decrease in GPT means, and on the other, by an increase in SPT, TTT, GT and SP, as can be seen in thefigure. The training balance means presented in Fig.3, can be considered as an example of highly qualified grass hockey sportswomen's to intensity that keep the effective participation in competitions.

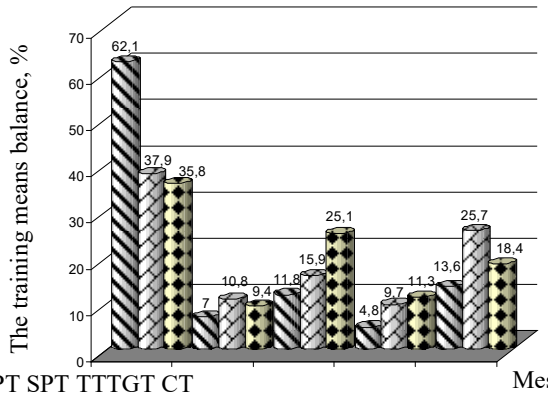

Fig. 3. The training means balance of highly qualified grass hockey sportswomen in the mesocycles of the preparatory period, %:

GPT- general physical training , SPT- special physical training, TTT - technical and tactical training, GT - game training and CT- competitive training;

▧ -basic developing mesocycle;▨- basic stabilizing (control and preparatory) mesocycle;▩ - precompetitive mesocycle

Each training, like the macrocycle as a whole, is characterized by the training, the intensity amount and the direction of the training effects, which depend on the physiological mechanisms of energy supply for the movement. The size of the trainingload, which was defined in points, in our opinion, does not characterize the value of the training effect in the whole.

It cannot be stated definitely that, 120min training with index amount intensity(IAI) 860 points[1] influenced to a greater training effect, than 60 minutes training with IAI 580 points. It is necessary to take into account the intensity and direction of the training exercises. So, besides the index amount trainingintensity, the index intensity training demands (IITD) should also be defined. Training demands intensity dynamics of highly qualified grass hockey sportswomen in BDM, BSM and PM is presented on Figure 4-6. While constructing macrocycles, the main principle of sportswomenpreparation was kept- the principle of waviness, that is, the change of classes, both in length and aim. The IITD definitionsof the figures, can also be considered as examples when planning the training intensity while prepare.

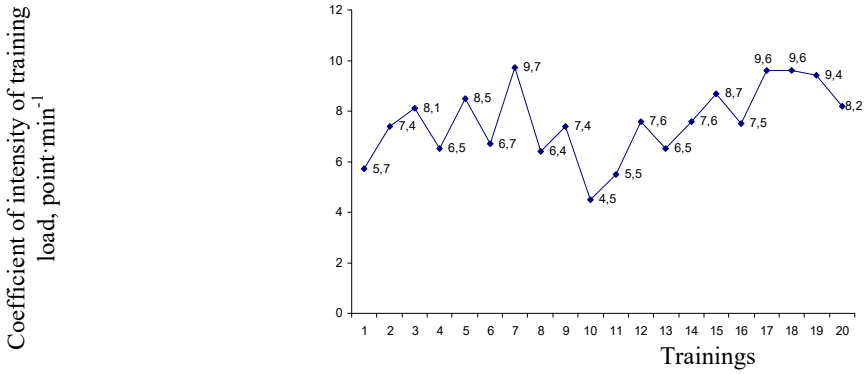

Fig.4. Training loads intensity dynamics of highly qualified grass hockey sportswomen (the coefficient of intensity of training load) in the basic developing mesocycle

[1] the methodic of determining the load value coefficient (in points) and the coefficient of intensity of training load (in point·min^{-1}) is described in detail in discussion

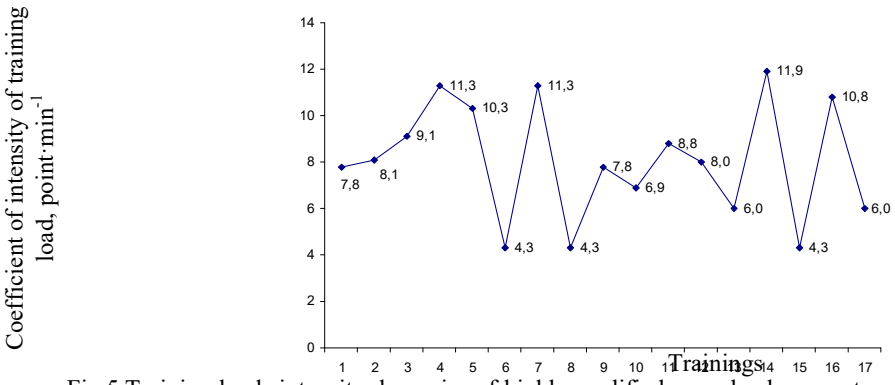

Fig.5.Training loads intensity dynamics of highly qualified grass hockey sportswomen (the coefficient of intensity of training load) in the basic stabilizing (control and preparatory) mesocycle

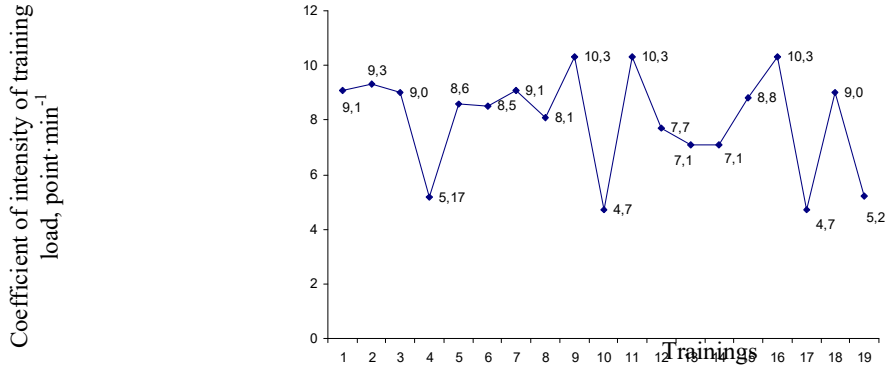

Fig.6.Training loads intensity dynamics of highly qualified grass hockey sportswomen (the coefficient of intensity of training load) in the precompetitive mesocycle

Physical characteristics and functional preparation (tab. 5) are the criteria for adaptation of grass hockey sportswomento training and competitive intensity over a certain period of the training.

Table 5

Physical and functional preparation characteristics of highly qualified grass hockey sportswomen (n=19) in the training mesocycle

Physical and functional preparation characteristics		Statistical values of indicators ($\bar{x}$ ± S)			
		The preparation mesocycle			
		Warming-up mesocycle	Basic developing mesocycle	Basic stabilizing mesocycle	Precompetitive mesocycle
Tests of physicalpre paration	Running 30 m from standing start (head start), s	4,98±0,12	4,90±0,21	4,84±0,17	4,82±0,15
	Standing long jump, m	2,03±0,06	2,00±0,07	2,02±0,13	2,10±0,12
	Shuttle run (bleep test)180 m, s	42,64±1,08	42,47±1,48	41,71±0,87	41,69±1,15
	Running 2000 m, s	522,0±29,1	521,0±22,4	516,3±39,28	506±20,1
Functional preparation characteristics	IAI, s.u. (standard units)	2860±124	2843±228	2835±152	2582±161
	ORI, s.u. (standard units)	18,0±2,1	18,2±5,1	20,1±3,4	18,4±4,4
	OAI, s.u. (standard units)	11,4±2,1	13,6±4,0	13,2±2,1	13,8±4,5
	MOC_{abs}, $l \cdot min^{-1}$	2,74±0,23	2,84±0,07	2,78±0,08	2,82±0,09
	MOC_{com},$ml \cdot min^{-1} \cdot kg^{-1}$	47,3±3,4	47,8±7,7	50,1±3,5	47,8±3,39
	$PWC_{170(V)}$, $m \cdot s^{-1}$	2,95±0,21	3,04±0,45	3,10±0,41	3,25±0,22

Notes: IAI- integrated adaptation index; ORI - operational recovery index; OAI - operational adaptation index; MOC_{abs} - absolute score of maximum oxygen consumption; MOC_{com} - comparative score of maximum oxygen consumption; $PWC_{170\,(v)}$- physical efficiency according to the running variant of the PWC_{170} test

Analyzing Table 5, we can conclude according to the development of speed, speed andmuscular strength, general and speed endurance for women's hockey teams, there is positive dynamics almost throughout all stages of the grass hockey sportswomen's adaptation to training intensity. At the same time, there is a certain tendency,which is characterized by the significant increase in results between the warming-upmesocycle and the

basic developing mesocycles and certain stabilization of testing scores in the basic developing, basic stabilizing and pre-competitive mesocycles.

Discussion

The sportswomen's adaptation totraining and competitive intensity during the macrocycle preparation is one of the training main tasks (Volkov et al, 2000; Mishchenko,2004; Hodik, 2006; Kostiukevich et al, 2019).

The systematic approach was used in our research. Its aim was to control the training, which was divided into five types: general physical training, special physical training, technical and tactical training, game training and competitive training. Each of them is done in six zones of intensity (Table 1). Besides, coordination complexity conditions (CCC)were defined: 1 CCC- exercises were done stand-fast, or comfortable speed movement; 2 CCC- exercises were done with space and time limit; 3 CCC- exercises were done in the opposite active interference condition.

It was very important to define the impact intensity range of different directions.That is why, the load value coefficient (LVC) and training load intensity coefficient (IC_{tl}) were chosen.

The training load value coefficient can be counted by such formula:

$$LVC = \sum_{i=1}^{n} t_i \cdot I_i,$$

wheret_i – time of certain exercises; I_i – intensity of certain exercises (points). The exercise done with the heart retae (HR) 114 bpm and evaluated by 1 point; 120 bpm – 2 points; 126 – 3; 132 – 4; 138 – 5; 144 – 6; 150 – 7; 156 – 8; 162 – 10; 168 – 12; 174 – 14; 180 – 17; 186 – 21; 191 – 25; 198 – 33 points.

The training load intensity coefficient can be counted by such formula:

$$IC_{tl} = \frac{LVC}{T},$$

where T- the training time.

As a result, on the one hand the sportswomen training kinds were found, on the other the training impact criteria on sportswomen bodies were.

Such methodological method, has defined the novelty of our research, comparatively with another scientists, studying the sportswomen's adaptation problem considering the intensity during training(Kostiukevych, 2007; Shkrebtii, 2004; Kozina et al, 2017; Wilmore, Costill, 2004).

The main principles of training schedule in the macrocycle based on the periodization theory were kept. It was too necessary to do sportswomen training during preparation according with sport training principles, above all, consistency, waviness, cyclicity (Platonov, 2013; Fedotova, 2007; Tiulenkov, 2007).

The results of our research are added by data according the sportswomen organizing phase of the sport fitness (Hodik, 2006; Kostiukevich et al, 2017, 2018), and using the tests result it is able to evaluate the level of highly qualified grass hockey sportswomen during the preparatory period of the macrocycle.

Conclusion

1.Highly qualified grass hockey sportswomen's adaptation to the athletic intensity of training and competing during the preparatory period should be done in accordance with the sport's particularities and the calendar of the main competitions in the annual macrocycle.

2. The duration of the preparatory period for highly qualified grass hockey sportswomen varies within 50-70 days. Four mesocycles should be carried out during this period: "warming-up", basic developmental, basic stabilizing (control and preparatory), and precompetitive.

3. The optimal adaptation processes planning for highly qualified grass hockey sportswomen in team game sports should be carried out, on the one hand, on the basis of the training components, and, on the other hand, taking into account six zones of training intensity.

The perspective of the further research of the given problem will depend on studying the adaptation processes of highly qualified grass hockey sportswomenthroughout the year's training cycle.

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